3 SEPTEMBER 1958

GAS IN INDUSTRY

Supplement to the "GAS JOURNAL"

Vol. 1 No. 5

This is for the record

A new chart roll is being fitted to the Arkon Recorder. The old one has gone for analysis and comparison. Soon the door will be closed and the pen will make its clear current indication.

Arkon Recorders measure gas and air flow, pressure or vacuum or pressure and vacuum; flows in one inch pipe or 36 inch mains, pressure or vacuum from 0.1 inches water gauge to 50 lbs. per square inch.

They give a clear, unmistakable record which you can read like a book without hesitation and without mistakes. You can leave the chart on for a few hours, a day, or a week—the record will always be there. Easily read, easy to look after, robust enough to stand on the job, Arkon Instruments can help the control of any process—and their accuracy will satisfy even the men in the lab.

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THERMIC

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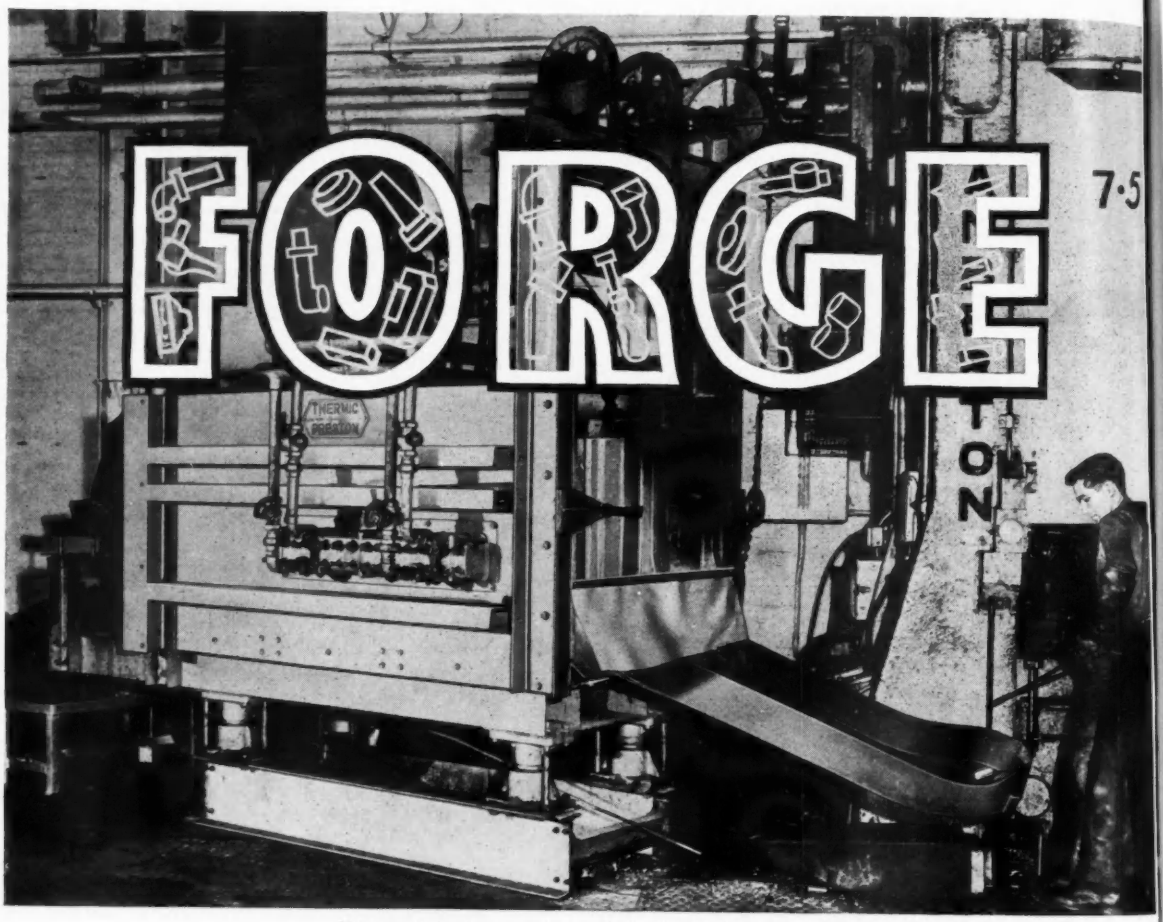

(Photograph by kind permission of The Austin Motor Co. Ltd.)

FURNACES

A wide range of standard or tailor-made mechanised forge furnaces is available, Pusher Type – Rotary Hearth Type – Conveyorised Bar End Heating, with GGC scale-free heating system or fired by Standard Town Gas.
The Photograph above illustrates a small Thermic Magazine Feed Pusher furnace fired by CC Burners. Output: 7-cwts. of small billets per hour.

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GAS IN INDUSTRY

SEPT. 1958

Vol. I No. 5

FEATURES

INTRODUCTON OF GAS - FIRED CENTRAL HEAT TREATMENT PLANT HALVED LABOUR FORCE

REPAIRING THE PAINT ON 'M.Gs.'

LEWISHAM'S CREMATORIUM — SOLVING THE AESTHETIC PROBLEM. ALSO INCREASED GAS EFFICIENCY

NORTH THAMES H.Q. DIVISION HELP IN SPECIAL PLANT INSTALLATIONS

EAST MIDLANDS GAS BOARD TEST NON-SCALE FURNACE

COFFEE DRINKING IS INCREASING. —By 'Gastronome'

Published by

WALTER KING LTD
11, BOLT COURT, FLEET STREET
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Telephone: FLEet Street 2236-7

Telegrams: Gasking, Fleet, London

Editorial

Gas—and a Social Problem

IN this issue is a short account of the cremators at Lewisham Crematorium. Gas for firing cremators seems to be eminently satisfactory and its extended use has enabled industrial gas engineers to co-operate with designers in improving the process's thermal efficiency and at the same time almost totally abolish aesthetically-undesirable smoke.

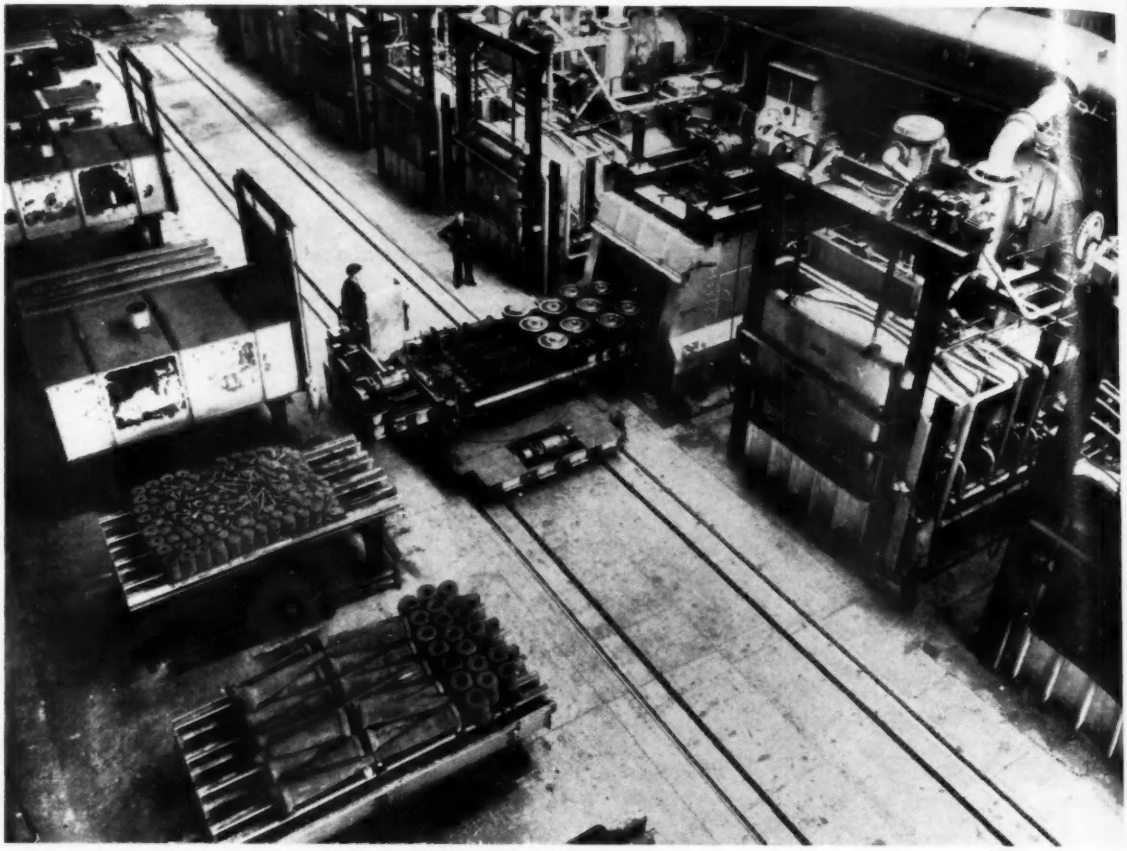
The problem at the outset was to produce a furnace which would bring the charge up to ignition temperature and, by the admission of secondary air, burn without smoke emission the very large volume of volatile products given off by the process. Ignition temperature must obviously be maintained throughout the period of cremation and the remaining solid material consumed to an incombustible ash. A gaseous fuel, with its ease of control over periods of changing conditions within the cremator itself, has very distinct advantages over an electrically- or solid fuel-fired system.

It is notable that in the year 1957-58 the total gas consumed by 833 cremations at Lewisham amounted to 228,400 cu.ft., or an average of 274 cu.ft., less than two therms per cremation.

The importance attached to the prevention of smoke emission is shown by the precautions against it. Conditions inside the cremator are likely to change without warning and it has been found that it is more satisfactory to have the furnace manually-controlled by a skilled attendant. To assist him at Lewisham a smoke detection unit has been installed in the chimney which will give warning of the presence of smoke before it appears outside. The necessary adjustments to the furnace can then be made in good time.

Cremation is increasing in Great Britain and some estimates are as high as 28% of all deaths, though more conservative estimates are rather lower at 23 to 24%. Based on statistics over the last 20 years there is every probability that the proportion of cremations may be as high as 50% by 1970. The first crematorium in Great Britain was built at Woking in 1885 followed by that at Golders Green in 1902; by the end of 1958 there will be some 115 crematoria throughout the country. This tendency is bound to continue in a country as densely populated as ours, where we are finding it increasingly difficult to make space outside towns and cities for new cemeteries. Other European countries, notably Denmark and Switzerland, have also found it necessary to encourage the practice.

From the gas industry's point of view, therefore, there are at least three reasons why the load should be thought of as a desirable one: First, the inevitability of its expansion. As land becomes more valuable the extra cost over that of burial may well be considered for subsidy. Finally, it is one of those rare loads the stability of which is not likely to be greatly influenced by fluctuations in the national prosperity.



General layout of the new plant.

INTRODUCTION OF GAS-FIRED CENTRAL HEAT TREATMENT PLANT HALVED LABOUR FORCE

COMMISSIONING of the new central heat treatment plant at the Darley Dale works of Firth-Derihon Stampings, Ltd., has cut the labour force previously employed on heat treatment by 50%, and the maximum number of heat treatment furnaces in operation by 75%.

GREATER ACCURACY

When the Darley Dale works were built in 1941-42, conditions necessitated the installation of a coke-fired producer gas plant to operate in conjunction with producer gas-fired forge reheating and small batch type heat treatment furnaces.

These operated satisfactorily up to 1956, when the need for much greater accuracy of heat treatment procedure to deal with the whole range of the highest quality alloy and carbon steels, nickel-based and titanium alloys, together with increasing maintenance requirements of the gas producer plant, brought about the decision to change over to the use of town gas for all furnace firing and to modernise the furnace equipment.

The first stage in the modernisation programme was the laying of a 12-mile long by 15 in. diameter high pressure town gas main from Chesterfield via Matlock to the Darley Dale works, the installation of a new high capacity town gas meter and governor house, and extensive modification of the internal distribution gas main.

CONCENTRATION

While the Darley Dale and Tinsley works had previously been responsible for the heat treatment of their own production, it was decided to instal a complete new heat treatment plant at the Darley Dale works, which would be capable of handling the whole of the heat treatment requirements of the Company, and to concentrate all heat treatment at these works.

JOINT DESIGN

The new plant, which incorporates many advanced ideas, was designed jointly with Gibbons Bros., Ltd., Honeywell-Brown, Ltd., Hartons, Ltd., and members of the Brown-Firth research laboratory, and consists of:—

Three Gibbons dual-system town gas-fired heat treatment furnaces.

Two Gibbons town gas-fired tempering furnaces.

A Gibbons oil quenching machine.

A Gibbons-Van Marle turntable charging machine.

Loading tables and special type cooling tables.

An instrument control room.

A centralised waste gas discharge system.

All furnaces are 11 ft. long by 6 ft. 6 in. wide by 3 ft. 3 in. high to the

spring line of arch in doorways. Furnace loads up to 5 tons weight are handled.

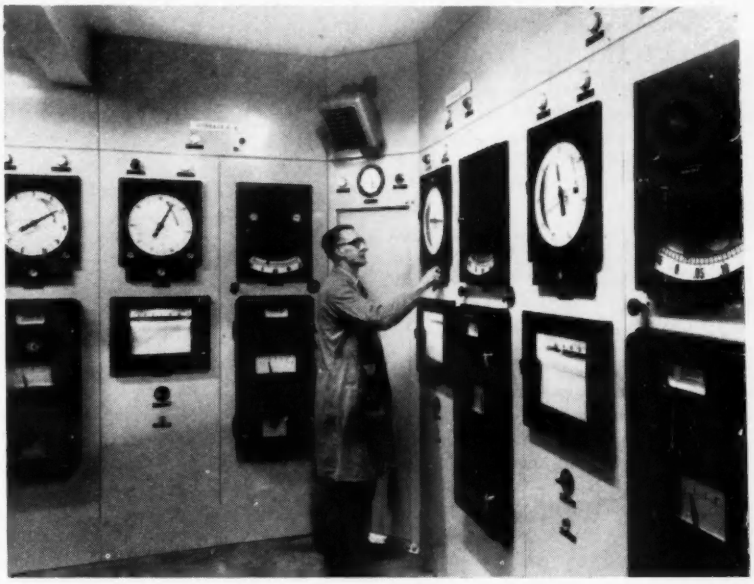
The dual-system furnaces have normal operating temperature ranges of 200-750°C. with forced recirculation, and 750-1,250°C. without forced recirculation.

CONTROL ROOM

The tempering furnaces have normal operating temperature ranges of 200-750°C. with forced recirculation.

Furnace temperatures are electronically controlled by a fully automatic electro-pneumatic system, the Honeywell-Brown control instruments being housed in a centrally positioned air-conditioned instrument control room.

The tempering furnaces are two-zone controlled and the dual-system furnaces single-zone controlled. Temperature distribution throughout the furnaces is held to extremely fine limits and is indicated and recorded at any six points in each furnace.



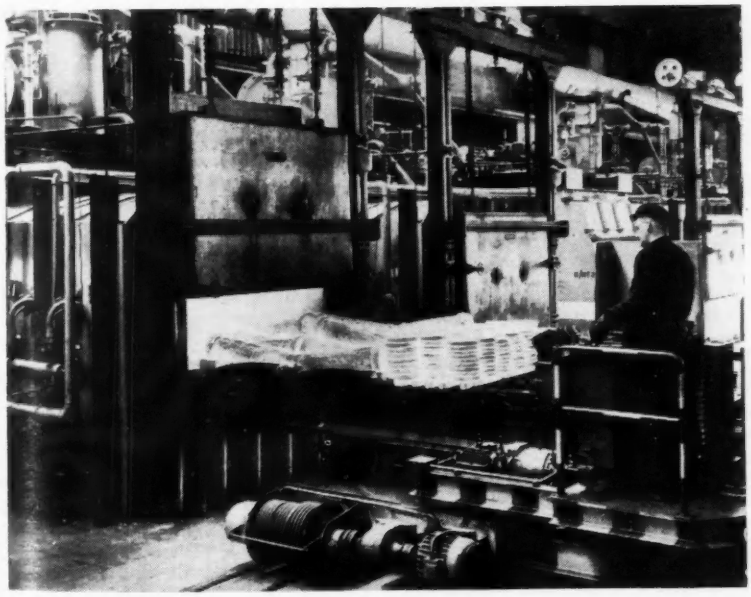
A section of the air-conditioned instrument room. The heat treatment foreman is shown adjusting the controller of one of the dual system furnaces.

FAILURE SAFETY

All furnaces are fully instrumented and controlled to safeguard against failure for any reason. Compressed air supply for operation of the pneumatic control equipment is obtained from duplex air compressors and receiver units mounted on top of the centrally sited instrument control room. The actuation of the air compressor units is automatically controlled via the instrument control room. Kent gas-flow recorders are used to record gas-flow rates and total gas consumptions of each furnace.

All waste gases from the furnaces are collected through a centralised overhead waste gas main and then discharged into the atmosphere via a high capacity waste gas exhaust fan and chimney stack.

The oil quenching machine is of advanced design, being of the fully enclosed type with automatic door operation. Automatic lowering and lifting of the load with variable-controlled oscillation of the load during the quench period is also incorporated. This ensures the optimum oil flow conditions during the quenching cycle.



Napier half-shafts and crown wheels being withdrawn from a dual-system furnace prior to transfer via the rotating charging machine to a forced air cooling table.

OIL QUENCHER

For cooling the oil in the quench machine, the oil is drawn from the top of the tank; passed through a water-cooled oil cooler and returned to the tank via distribution ducts in the tank base. The oil cooler is capable of dealing with 27,000 gal. of oil per hour, using 12,000 gal. of water per hour. Oil temperature is shown by an indicator on the discharge pipes from the oil tank.

The charging machine used in conjunction with the loading tables, furnaces and oil quench machine is an all-electric, 4-arm turntable design arranged for 5-ton loads. Four motors are used for hoisting, lowering, charging and discharging, traversing and rotation. Power is supplied to the charging machine via a specially designed motorised cable-drum unit, mounted on the charging machine, the feed cable being laid down in a small duct below floor level.

NO MANUAL HANDLING

The general layout has been designed to handle large and small batch production efficiently and to eliminate manual handling as the plant has to deal with a wide range of forg-

ings varying in weight from a few ounces up to about 800 lb.

STILLAGED LOADS

All incoming materials are received into the reception bay in stillaged form; diesel-engine forklift trucks and electric battery-operated stillage trucks being used for the movement of all stillaged loads into the storage area, between the storage area and the loading tables, after treatment, and for the movement of stillaged loads to the adjacent inspection department.

OVERHEAD CRANES

In the main heat treatment bay, electric overhead cranes are used for assembling the heavier forgings on the loading tables, etc. Dependent on the weight and section of the forgings to be treated they are loaded into special heat-resisting furnace trays or on to heat-resisting bearer-bars. After the load has been assembled on the loading table it operates as a unit load throughout all subsequent operations in the heat treatment department.

A conveyancer 6,000 lb. capacity, diesel-engined, fork-lift truck moving a stillaged load of forgings in the heat treatment reception bay.

Repairing the Paint on 'M.Gs.'

THE M. G. Car Co., Ltd., paint repair plant at Abingdon consists of a conveyorised tunnel 150 ft. long in which the cars are cleaned, sprayed over the damaged panels, 'flashed-off' for volatiles, and dried. The last operation takes 50 ft. of the tunnel.

The sections are separated by air-curtains, which maintain the temperature differentials.

Output is at the rate of four cars an hour.

Air-replacement in the spray booth requires 35,000 cu.ft. of air per minute, raised to 80°F., and is provided by a No. 5 Volex indirect gas-fired air-heater rated at 5,750 cu.ft. of gas per hour.

The air is drawn from above roof level by means of a 5 ft. rectangular duct fitted with a 20 h.p. Aerofoil fan and is distributed through glass-wool filters.

The oven section requires an even temperature of 180°F. and this is provided by two No. 2½ Volex heaters, rated at 1,250 cu.ft. of gas per hour each, fitted in parallel, and delivering 4,000 cu.ft. of air per minute at a duct temperature of 300°F.

Hot-air distribution is by means of two rows of suspended nozzles running the length of the oven and 50% recirculation is used. A 4 h.p. centrifugal hot-gas fan is used for this purpose.

The Continental Press

THE DRYING OF INGOT MOULDS

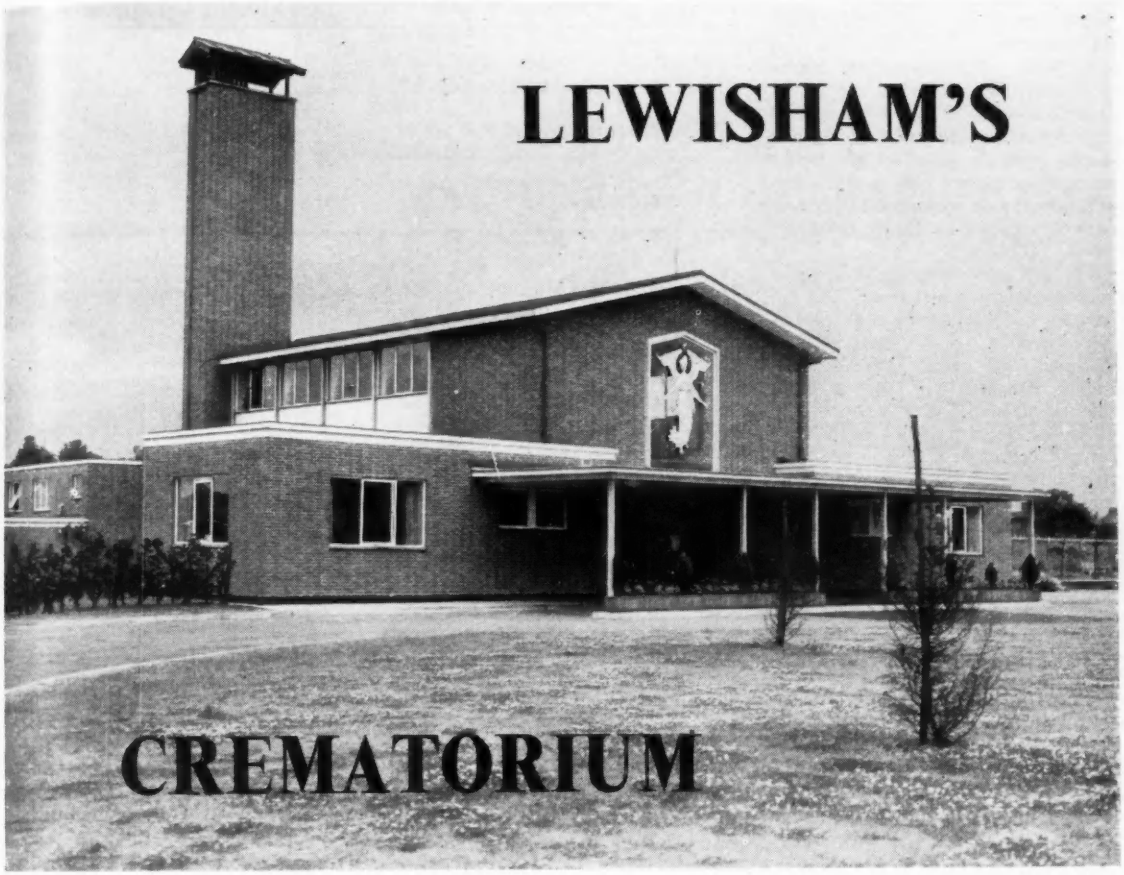
THE 'threechamber' ring burner in which air for combustion and injection is supplied at considerable velocity (40 to 60 m. per sec.) through a central jet, is particularly advantageous when drying ingot moulds owing to the circulation from the injector effect.

This is produced by directing the high-velocity flame into a heat-resistant alloy cone. If such a burner is mounted at the bottom of an ingot mould, firing into the mould with the top of the mould closed by a metal plate and an annular plate placed between the burner and the cone, a closed circulation will result.

The circulation is up the axis in the flame jet, down the inside walls of the mould, and inwards through the plate to the injector cone.

These burners are made in four sizes of 8, 15, 30, and 50 cu. m. per hour, with 500 mm. water gauge pressure at the air jet. Comparison with other methods of drying moulds shows a 20% reduction in hourly gas consumption and 30% saving in time.

Rickhey. Gaswärme, Vol. 7, No. 4, April, 1958, p. 145.



LEWISHAM'S CREMATORIUM

Solving the æsthetic problem also increased gas efficiency

LEWISHAM'S crematorium, which was opened in 1956, was built on an extension of the existing cemetery. Set amid informal gardens and a watercourse it presents a pleasing appearance with its flat roof and silver grey brick facing. Inside the chapel the scene is dominated by an apse which contains the catafalque.

Committal is accomplished vertically by an electro-hydraulic lift connecting the chapel with an annexe of the furnace room; this houses two Dowson & Mason gas-fired cremators, with provision for a further two.

Lawnswood Type

The cremators are of the well-known 'Lawnswood N.E. Gas' design orginated by the North Eastern Gas Board in close collaboration with the Lawnswood Crematorium, Leeds, and further developed by the licensed manufacturers, Dowson & Mason Ltd., in co-operation with these authorities.

The main reason for the introduction of this type of cremator was to eliminate the emission of smoke from the chimneys of crematoria, which was at that time a major æsthetic problem, but it rapidly became apparent that the scientific approach which was adopted to obtain complete combustion and hence freedom from smoke so increased the thermal efficiency that lower gas consumptions were realised than had previously been thought possible.

On the next page is shown a cross-section of the Lawnswood N.E. Gas cremator. The upper or main working chamber is provided with burners in the roof and a hearth of perforated construction to allow burning gases to enter the middle chamber for a secondary phase of combustion. Spent gases pass into the bottom chamber and into a series of vertical flues communicating with horizontal passages above the main arch from which they are drawn into eductors which have jets fed from the main combustion air fan.

This system promotes a flue pull independent of the crematorium chimney and ensures adequate suction in the cremator at all times. The whole forms in effect a most efficient combustion system, enabling the thermal content of the charge to be released and requiring little gas to complete a cremation after the initial raising of temperature of the charge.

The consumptions at Lewisham have shown good results after the initial starting period and settling down to normal operation. Records are given in Table I.

These figures are slightly inflated as one Ascot multipoint water heater and two Ascot sink heaters are recorded in the same meter.

The cremator at Lewisham is a twin unit which is in effect two independent cremators in a common casing. The capacity is equal to two separate single cremators, but an appreciable reduction in width and therefore of floor space and building dimensions is possible.

It is generally recognised that as the inherent combustion character-

istics of individual cremations vary quite widely, fully successful operation in respect of both elimination of smoke and gas consumption cannot be obtained by automatic control of the cremator. The combination of skilful operation and properly designed manual controls gives much better and more consistent results. Such an operation can anticipate the changing conditions occurring during the cycle and act accordingly.

With this dependence on the human element material assistance can be given to the operator by the installation of smoke density equipment in the main flue which affords continuous indication of the possible presence of smoke even when this is too low in density to be visible as a chimney emission. The instrument can also be arranged to give an alarm signal should smoke be present in excess of a predetermined degree, drawing the operator's attention to the conditions before they become noticeable at the chimneys by local residents or the general public and allowing him time to make correction.

Smoke Detection

The two cremators are fitted with Kelvin Hughes smoke detector equipment.

Fully automatic up to the remedial stage, the Kelvin Hughes equipment consists essentially of three basic components, namely, the power supply units, the detector assembly, and the controller.

The detector assembly comprises a transmitter unit and receiver unit mounted diametrically opposite in the common flue from the two cremators, the transmitter incorporating the adjustable focussing reflector. The light source is a nominal 12-volt pre-focus lamp, operating below its normal rating to ensure long life. A green indicator lamp in the outer casing of the unit glows during the operation of the transmitter unit light, but does not operate in the event of transmitter light failure. Focussing and alignment are effected through an aperture in the reflector.

The receiver unit consists essentially of a barrier layer photo cell, the output of which is arranged to feed directly to an indicator and the input to an alarm circuit.

A constant voltage transformer is supplied with the equipment and provides accurate compensation for mains voltage variation.

Both the receiver and transmitter are sealed from flue gases by glass screens, surface fogging being reduced by an induced flow over the screens of clean air from the flue suction.

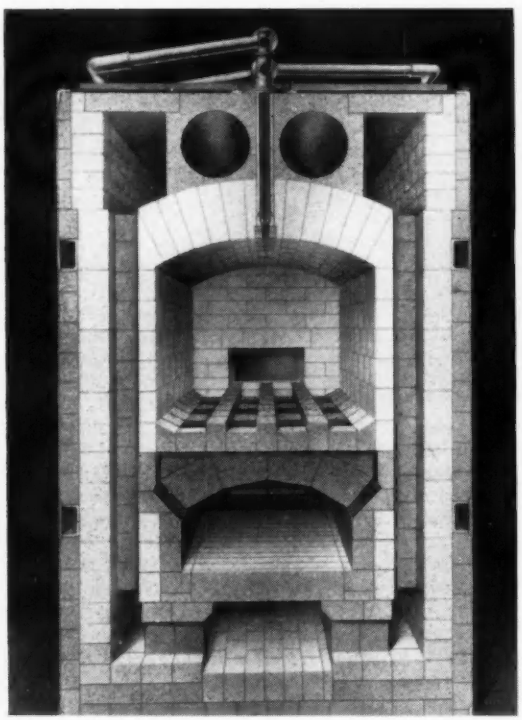
TABLE I.

Period	No. of Cremations	Total Gas Consumption	Average per Cremation
		cu. ft.	cu. ft.
14. 6.56—17. 9.56	245	144,700	592
17. 9.56—14.12.56	167	74,900	455
15.12.56—28. 3.57	179	67,300	378
29. 3.57—24. 6.57	166	64,900	390
25. 6.57—25. 6.58	833	228,400	274

Photo-transistor

The controller is grouped with the standard temperature and draught gauges, at the control end of the cremators and is calibrated in percentage obscuration. The instrument embodies a sensitive moving coil galvanometer in the measuring system and an 'indefinite life' photo-transistor in the control system.

A control 'set' point is provided on the instrument, adjustable externally,



Left: *Cross section of the Lawnswood N.E. Gas cremator.* **Right:** *General view of the control end of the two Dowson & Mason cremators showing the light unit (top right) and the instrument panel.*

and set in this instance at 10% obscuration.

The power supply unit consists of a mains input transformer and provides a supply to the detector assembly. In addition a moving coil relay is fitted for the actuation of the alarm circuit.

Combustion Factor

Due to a variety of conditions, principally the incorrect settings of the flue draught controls, inefficient fuel combustion in any furnace causes an increase of the degree of solid matter in suspension in the flue gas. As the light received by the detector unit is inversely proportional to the quantity of solid matter in the flue gas, the output of the photo cell will vary.

Visual Alarm

Below the 'set' point on the controller, the photo-transistor receives full illumination and maintains a relay in the energised condition. When obscuration exceeds the 'set' point, a vane attached to the indicating pointer of the measuring system obscures the light to the photo-transistor and the relay is de-energised, making the supply to the alarm circuit. In this application the alarm is of a visual nature, the lamp remaining illuminated until remedial action restores the strength of the light source.

In the first year of operation of the equipment the municipal authorities of Lewisham did not receive one complaint from residents in close proximity to the crematorium, in spite of the fact that the building is situated in a heavily populated area.

MACHINE TOOLS HARDENING

HEAT treatment in the manufacture of machine tools plays a very important part. Today's materials must be able to withstand heavy stresses with the minimum of wear so as to ensure continual operation without metal fatigue or failure.

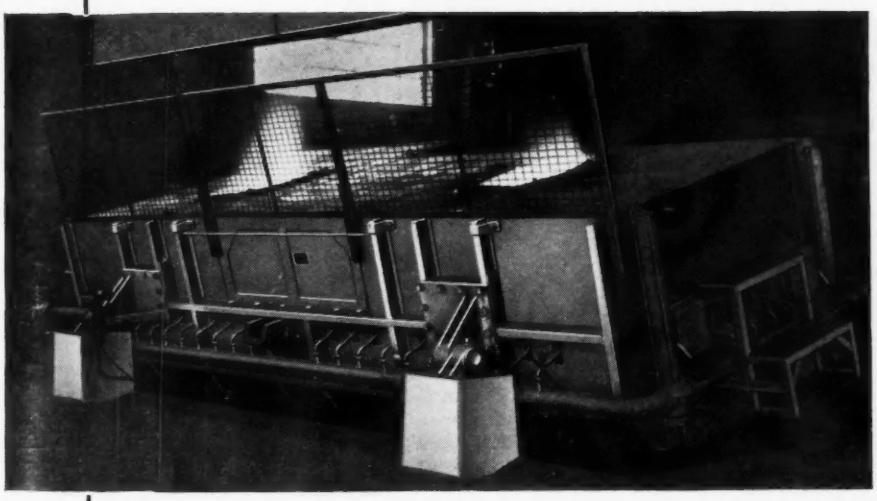
The whole of the heat treatment required for the manufacture of B.S.A. machines is achieved in a compact heat treatment department. Housed in the heat treatment department are a number of gas-heated furnaces, the largest being a Gibbons batch-type furnace with a hearth area of 96 in. by 42 in. This furnace is used mainly for normalising such components as castings, main spindles, cam and gear blanks, etc. A large amount of core refining after carburising is also carried out, and large components for box-carburising are dealt with in this furnace.

To local-anneal small components a gas-heated pot containing molten solder is used. The component is immersed in the molten solder until it reaches the temperature of the solder.

Three Lucas batch-type furnaces hearth area 48 in. by 30 in., are used for refining and hardening after carburising. These furnaces are also used for hardening and tempering medium carbon steel, and alloy steels, for such components as gears, gear levers and racks, etc. Recently these furnaces have been fitted with 'Amal' injector burners and hot face bricks.

B.S.A. Tools' method for cyanide hardening is carried out by using an I.C.I. gas-heated salt bath, size 10½ in. by 15 in. Another salt bath containing neutral salts is used for refining and hardening components after cyanide heat treatment. It is also used for small tool hardening. A gas-heated chemical blacking plant is available for colouring components when required.

LIP AXIS ALUMINIUM MELTING FURNACE



This furnace is gas fired of the open hearth type, specially designed for Melting Aluminium scrap.

It is heated by numerous small capacity burners of the automatic proportioning type.

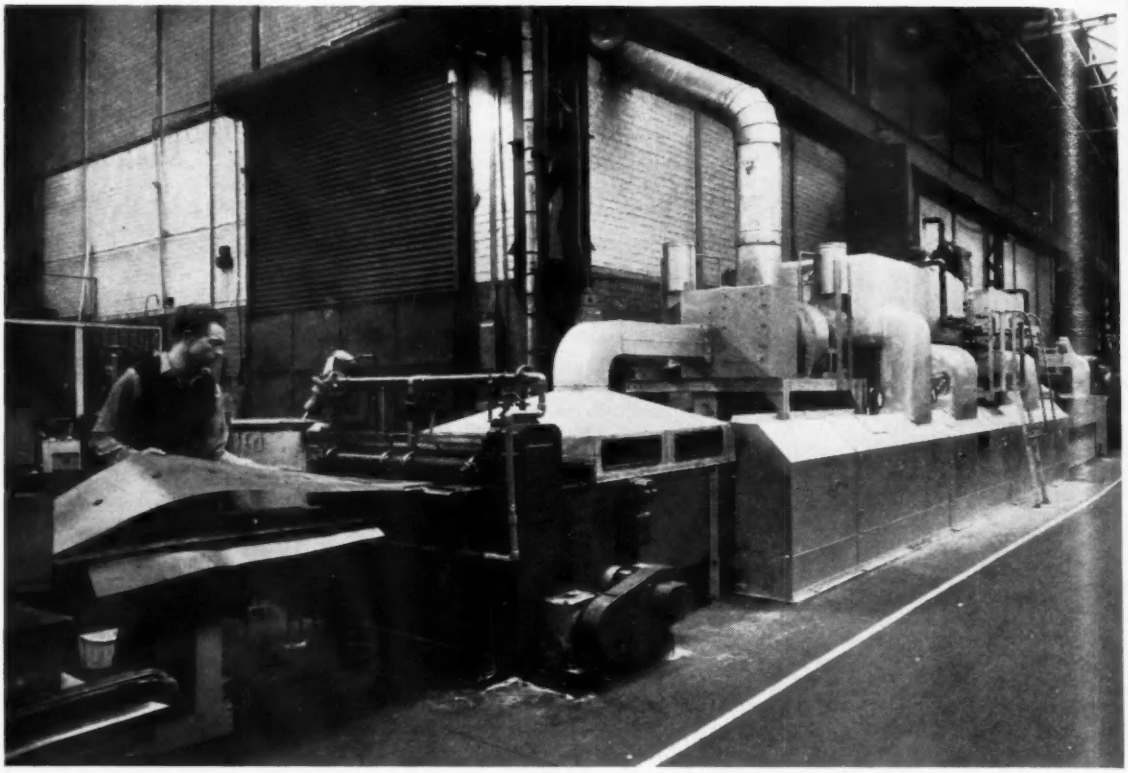
UGI GROUP

DOWSON & MASON LIMITED

ALMA WORKS · LEVENSHULME · MANCHESTER

Telephone: HEAton Moor 6251 (5 lines) Telegrams: Gasify, Manchester 19

C4740



The annealing of silicon steel sheets at the works of Fuller Electric Ltd.

North Thames H.Q. Division Helps to Solve Special Problems of Manufacturers

INDUSTRIALISTS in the North Thames Gas Board's area have never had very much trouble in getting practical assistance with their processing problems.

On these pages are some recent examples of special installations in the area.

1. TRANSFORMER CONSTRUCTION

GAS plays an important part in the manufacture of electrical power transformers at the Walthamstow (East London) works of Fuller Electric Ltd. The transformers are produced for both the home and export markets for use in connection with transmission of current at voltages up to 275 kV.

Transformers consist essentially of two windings inductively coupled by a laminated iron core. The use of cold rolled grain oriented silicon steel sheets in the construction of the core is a comparatively recent development, the sheets being approximately 14/1,000 in. thick.

The sheets are annealed at approximately 800°C., and then cut to size for laminating.

It is necessary to insulate each lamination with a suitable material—in this case a special patented varnish. This varnish consists essentially of a sulphite cellulose which must be dried and cured after application to the laminations. The laminations may be coated on one or both sides, and in order to achieve a high space factor of active material in the iron core, the varnish film is of the order of only seven to ten microns in thickness.

The purpose of the insulating film is to restrict the circulation of eddy currents in the iron core to prevent overheating. The process is, therefore, subject to close quality control as regards thickness, evenness and insulation value.

The varnish is applied by passing the laminations between rubber covered rollers on to which the varnish is fed. The laminations are then fed on to a conveyor under a pre-heating hood before entering the stoving oven. The main conveyor oven is supplied by hot hair from two direct gas-fired heaters which supply heat to the three heating bones. One heater supplies air to the final zone at a temperature of approximately 360°C., and the other heater the first and second zones at temperatures of 180°C. and 280°C. respectively, the heat for the first zone being bled from this heater.

Trunking System

Partial re-circulation takes place through a trunking system forming part of the construction of the oven.

Temperatures are controlled by indirect type thermostats, the temperature being recorded on a 24-hour recorder by Negretti & Zambra, Ltd. This ensures accurate and economical operation. Control equipment of the electronic type is embodied to protect the plant against fan failure, flame failure, and faulty operation, while

providing simple and automatic means of starting.

Design data of the unit is as follows:—

Controlled Heat & Air Ltd., Combined Varnishing Machine, Stoving Oven and Cooling Section.

Temperatures adjustable up to 380°C.

Maximum gas rate; 1,200 cu.ft. of 500 B.t.u. gas at 2½ in. w.g. pressure.

Heating Cycle:

1st zone, 10 ft. long 180°C.
2nd zone, 10 ft. long 280°C.
3rd zone, 10 ft. long 350/365°C.
Cooling Section 12 ft.

Baking times:

Adjustable between .5 and 1.5 minutes.

Production based on a 66% space factor:

One ton per hour at a speed of 30 ft. per minute.

Effective width of unit:

3 ft. 6 in.

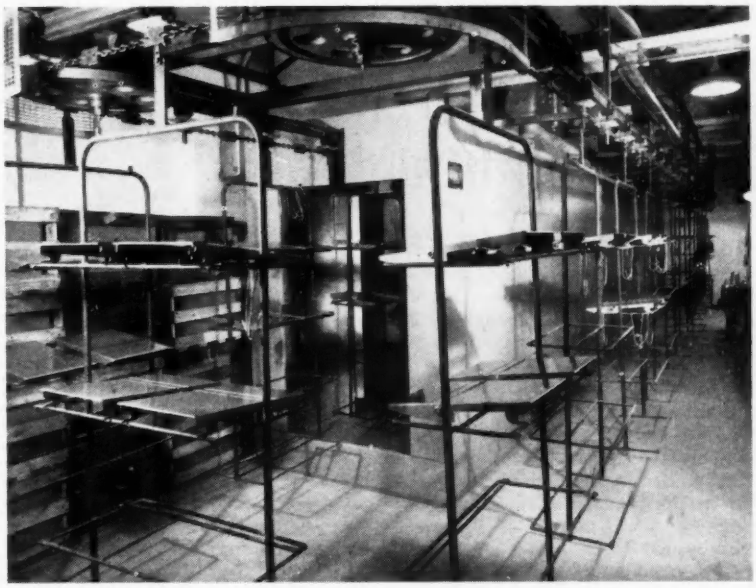
The plant is designed to handle cold rolled sheets and, therefore, rollers and other surfaces coming into contact with the sheets are rubber covered in order to avoid introducing internal strain into the sheets which would impair the grain orientation.

Maximum Speed

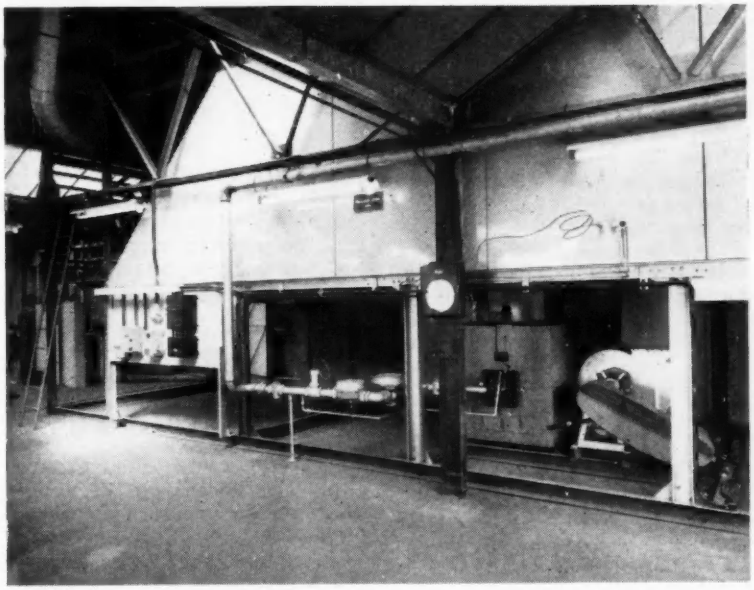
A special take-off roller is incorporated at the unloading end of the unit to ensure that the sheets are delivered clear of the conveyor rods.

The maximum speed of the oven is 50 ft. per minute and the oven is ready for operation within 30 minutes of lighting.

This type of plant was chosen for its flexibility, for the core laminations vary over a wide range of sizes, according to the type and design of transformers being manufactured in this large works.



Special plant for finishing metal parts at the works of Associated Automation, Ltd.



Camel-back type oven for stoving sheet steel components (see next page).

2. METAL PARTS FINISHING

A SPECIAL plant for the finishing of metal parts was constructed to the requirements of Associated Automation, Ltd., for handling accessories for office machinery and computers, and has a total length of 36 ft.

The heating zone is 16 ft. long and an air curtain at each end reduces heat losses to a minimum. The burner equipment consists of two Hypact type burners firing into a combustion space on the top of the oven.

The warmed air is distributed through a multi-orifice system to ensure a low temperature gradient in the oven.

Most of the parts to be treated are office machinery and computer accessory equipment, and 27 hanging racks on a conveyor belt have been designed to take small or large parts by the adjustment of connecting rods.

The operating temperature of 280°F. is automatically controlled and the paints used are specially manufactured for this temperature. The speed of the conveyor is set at 77 seconds per foot, the time taken for treatment being approximately 20 minutes.

Combustion safeguard equipment and a temperature recorder are incorporated, the full-on gas rate being three therms per hour. Fresh air entering the shop is filtered before being distributed in the stoving shop. Extract ducting completes the circulation.

The plant was supplied and installed

by Stewart Gill, Ltd., and arrangements for the gas supply were made by the North Thames Gas Board's Headquarters' Division.

3. STOVING SHEET STEEL COMPONENTS

THERE are occasions when floor space will not permit of horizontal traverse of conveyor systems. In such circumstances, plant can be built with vertical or steep gradient conveyors to give the production required without undue demand on factory capacity.

Such plant can be embodied into the production line, maintaining continuity of movement and direction of the finished parts.

The photograph shows a camel-back type oven installed to deal with a variety of sheet steel components. Approximately 140 mixed articles pass through the oven each hour, the speed of the conveyor being 1 ft. per minute; this can be varied to give treatment times varying from 8 to 22 minutes.

The overall length of the plant is 40 ft., the width 10 ft, and the height 13 ft.

Full automatic control ensures simple handling of the plant without the need for skilled operators.

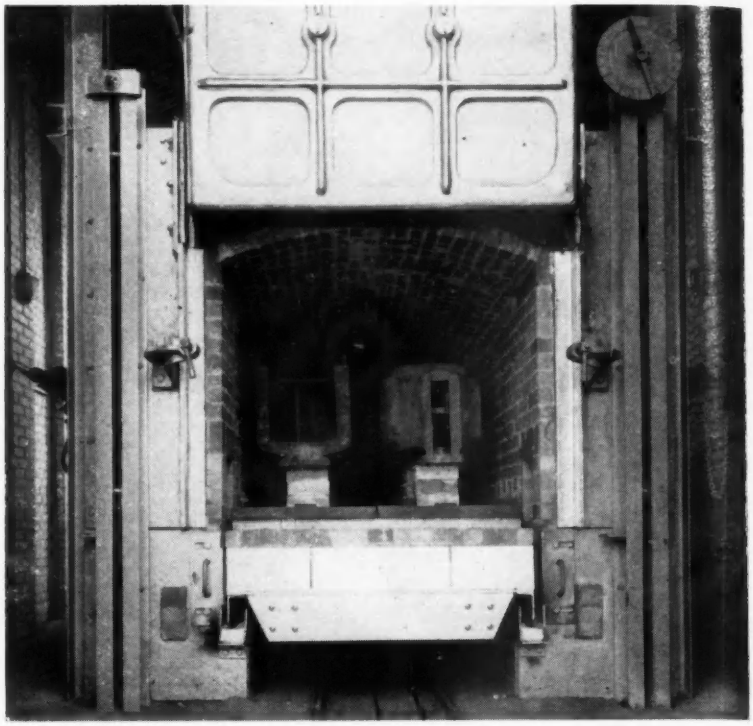
The gas rate to maintain the levels of output required is only 3.3 therms per hour.

The plant was supplied and erected in the factory of Adams Brothers & Burnley, Ltd., of Harrow, Middlesex, by F. J. Ballard & Co., Ltd. The installation was arranged by the North Thames Gas Board's Headquarters Division.

4. ANNEALING FERROUS CASTINGS

A FURNACE was supplied and erected by Incandescent Heat Co., Ltd., in consultation with the North Thames Gas Board's Industrial Section, Headquarters Division, for the annealing of ferrous castings.

The furnace is direct-fired, is double ended and measures 16 ft. 6 in. long by 4 ft. 6 in. wide by 4 ft. high from the deck of the bogey to the crown of the arch. It is served by two bogeys on to which the castings are loaded, each bogey filling the furnace. The furnace is fired by 14 airblast burners on each side of the furnace, air being supplied at approximately half pound pressure and gas at 3 in. water pressure.



Furnace for the annealing of ferrous castings, supplied and erected by Incandescent Heat Co., Ltd.

Temperature control is effected by a controller actuating a motorised dual valve working on the gas and air lines, the gas valve being by-passed.

The capacity of the furnace is ten tons of ferrous castings and the maximum temperature 980°C. Normally, the temperature required is 850°C. to 950°C. At present the time taken to raise a load to temperature is from 10 to 12 hours, the furnace not being forced. When the temperature is reached, gas is turned off, the stock cools down in the furnace, taking approximately 36 hours.

Revised Booklet Published on Gas Overhead Radiant Heating

JUST published by Bratt Colbran, Ltd., is 'Booklet No. 7,' dealing with overhead radiant gas heating. Previous editions of this publication were well received by the gas industry, architects, builders and heating engineers, as being the most authoritative and comprehensive treatise on the subject, and it is expected that this issue will also meet with a warm reception.

This new revised and enlarged edition consists of two main sections, the first dealing with general information on overhead heating with full particulars of the Company's range of heaters; the second part comprising detailed information sheets covering individual appliances.

The booklet is in loose-leaf form so that future additions can easily be inserted and, to facilitate filing, it has been produced to the British Standards Institute recommended size of 8½ in. by 5½ in.

The adequate heating of factories and workshops presents difficulties such as the necessity for rigid economy of floor space, the screening of radiant heat by machinery, down-draught in lofty buildings, danger from irresponsible individuals tampering with accessible heaters and the frequent problem of obtaining equal heating of every portion of a workshop.

Overhead radiant heaters can be used in such cases to warm the whole workshop, a bench or benches, a draughty corner, a group of workers, or to maintain an even temperature in a store. The heat from them reaches the individual or groups of individuals.

(*Continued on page 133*)

Industrial Gas Development Committee

WATSON HOUSE DESCRIBES HOW INFORMATION WILL BE GIVEN ON GOVERNORS

IN a report prepared by the Watson House laboratories for the Industrial Gas Development Committee and for the Watson House Centre, details are given of future reports it proposes to issue on proprietary constant pressure governors.

The present report shows the form in which the information will be presented and will act as a guide to the requirements of the gas industry. It will also help in the interpretation of the results of the tests to be undertaken on these governors to be presented in future reports.

The report will be set out as far as possible, as follows:—

1. Introduction. This will give the name and address of the manufacturer, sizes of governor available and any other relevant information.

2. Description. The description will normally be illustrated by two photographs, one showing the governor 'as received,' and the other showing it dismantled. Overall dimensions will be provided, possibly illustrated by a drawing, wherever desirable.

3. Test Results. Test results will be given, as far as possible, in the form indicated in Figs I and II.

4. Mechanical Examination. This will be carried out with reference to any relevant British Standard Specifications, and to good engineering practice. Regard will also be paid to ease of maintenance.

5. Conclusions. Recommendations and suggested modifications will be given in this section, with any response from the manufacturer.

Capacity Tests

Tests on the capacity and performance of the governor will be made using air, following which calculations of the equivalent performance using gas of specific gravity 0.5 will be made. Tests are conveniently made in the following order:

1. The maximum gas rate: This will be determined with the diaphragm fully depressed, and the inlet and outlet provided with appropriate connections. It will then be defined as that passed at a pressure drop through the governor of 0.3-in. w.g.

2. Variation of outlet pressure with gas rate at a constant inlet pressure: During operation, a governor in a gas line leading to a number of appliances, each subject to intermittent use, will be required to provide a constant outlet pressure, even though the gas rate varies. The same consideration applies to a governor serving an appliance with modulating or high-low gas rates due to thermostatic control. It is thus desirable to determine the variation of outlet pressure with gas rate. This can be done with the gas rate increasing, or with it decreasing, and a pair of determinations will be made for each set outlet pressure to cover those two possibilities.

Normally a series of determinations of outlet pressure with varying gas rate will be made, but at least one pair will be made with an inlet pressure of 5-in. w.g. and an outlet pressure of 2.5-in. w.g. set at half the gas rate quoted in Table I of this report. The first determination of each pair will deal with the measured outlet pressure as the gas rate is decreased from the maximum gas rate to the minimum desired, as shown in Table II. The other determination will be made with the gas rate increasing.

Additional Information

Further determinations of outlet pressure variation with gas rate that would be useful to the industrial gas engineer involve additional inlet and outlet pressures. The following are suggested:

(a) Inlet pressure:

(i) 10-in. w.g. (the maximum likely to be encountered in practice).

(ii) 1-in. w.g. or a pressure 0.5-in.

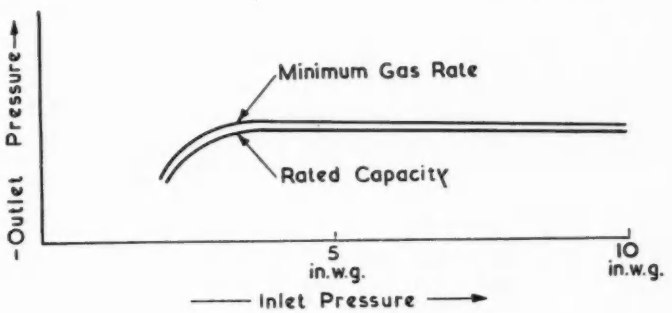


Fig. 1.

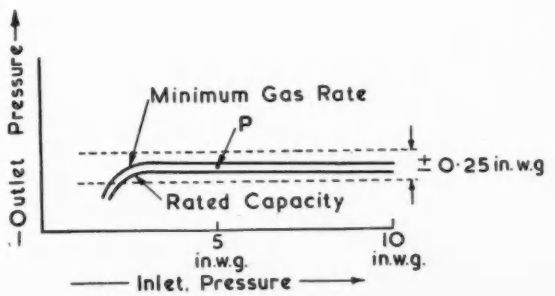


Fig. 1a.

* This information is reproduced from Report No. 653/57 of the Industrial Gas Development Committee of the Gas Council (information supplied by Watson House Laboratories).

w.g. greater than the minimum outlet pressure thrown by the governor, whichever is the greater.

(b) Outlet pressure:

The outlet pressure at half the gas rate given in Table I may be set at:

(i) 1.5-in. w.g.

(ii) 0.5-in. w.g. or the minimum operating outlet pressure, whichever is the greater.

Such determinations represent additional information, and any suitable combination of inlet and outlet pressure may be chosen.

Not Satisfactory

The maximum outlet pressure at which tests will be made is 2.5-in. w.g. since any appliance which requires a greater inlet pressure than 2.5-in. w.g. is not regarded as satisfactory by the gas industry.

3. Variation of outlet pressure with inlet pressure at a constant gas rate: A governor may be called upon to deal with varying inlet pressures while maintaining constant outlet pressure. Such varying inlet pressures can arise from variations in pressure in the mains, or from fluctuating demands in premises in which the governor may be installed. Tests will be made therefore to determine the variation of the outlet pressure with inlet pressure at constant rates of flow.

Initially, tests will be made at both minimum gas rate, as defined below, and the gas rate, as given in Table I. Determinations will also be made at higher or intermediate gas rates as may be desirable.

Further Test

For all governors determinations will be made with a set outlet pressure of 2.5-in. w.g. the setting to be carried out with a gas rate half that quoted in Table I of this report. Additional tests may be made, the most important being one at a set outlet pressure of 0.5-in. w.g., or at the minimum operating outlet pressure, whichever is the greater. Should the performance of the governor differ appreciably from that at a set outlet pressure of 2.5-in. w.g., then a further test at a set outlet pressure of 1.5-in. w.g. may also be made.

Tests will not normally be carried out at inlet pressures lower than 0.5-in. w.g. more than the outlet pressure.

Determinations will be made, beginning with an inlet pressure of 10-in. w.g., and descending to at least the minimum prescribed, of 0.5-in. w.g. more than the outlet pressure.

(4) Hunting and chattering: If, during the course of tests, hunting or chattering should occur, the fact should be noted.

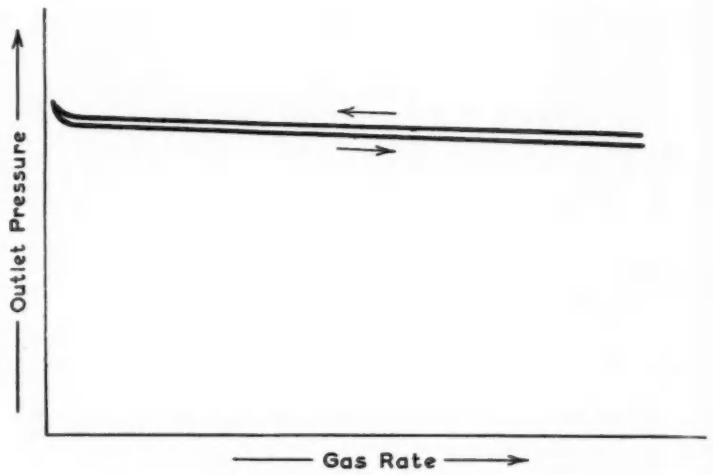


Fig. 2.

The most important characteristic of a governor is its ability to give a constant outlet pressure. It is also important however that a governor should pass sufficient gas, and a suggested standard is given in Table I. The determination of the maximum gas rate has already been described, and the figures then obtained should equal or exceed the rated capacity as given in Table I.

TABLE I
Rated Capacity for Constant Pressure Governors

Nominal size in B.S.P.	Flow rates at S.T.P. for 0.3 in.w.g. pressure drop, cu.ft. per hour	
	Air	Gas (sp.gr. 0.5)
¼	11	16
⅜	28	40
½	50	70
¾	85	120
¾	140	200
1	240	340
1¼	370	520
1½	530	750
2	890	1,250
2½	1,450	2,050
3	2,080	2,950
4	3,600	5,100
6	7,950	11,300

This table is taken from I.G.D.C. Report 538/53, D 034 'Ancillary Equipment for the Operation and Control of Gas Heated Plant' and it complies with the requirements of B.S. 1963; 1953 'Pressure Operated Relay Valves for use with Town Gas.'

Ability to Govern

The minimum gas rate can be defined as that down to which the governor functions satisfactorily. The ability to govern is discussed below, and the appropriate definitions made. Suggested values of this minimum are quoted in Table II.

TABLE II
Minimum Gas Rate

Nominal size of governor in. B.S.P.	Minimum gas rate cu.ft. per hour
up to and including 1	1
1¼ and 1½	3
2	5
2½ or higher	0.5% of that quoted in Table I

The ability to govern can be judged by examination of Figs. I and II.

To gain a quick assessment of performance, the graphs to be presented in subsequent reports on individual governors can be compared with Fig. III, which has been prepared to illustrate governor performance.

Ideal Case

At the top of the figure the ideal case is presented; here, for any loading of the diaphragm, variation of gas rate or inlet pressure should have no effect on the outlet pressure, that is, the lines on the graphs should be straight and perpendicular to the outlet pressure axis, as shown in Fig. III(a). In the practical case, the lines will be neither straight nor horizontal, and the further they depart from the ideal form shown in Fig. III(a), the less effective is the governor. Fig. 111(b) shows the performance to be expected of a good governor, while Fig. 111(c) illustrates the behaviour of an inferior governor.

The tests made of outlet pressure at constant inlet pressure, involving separate readings as gas rates are increased or decreased, are presented as shown in Fig II. The separation be-

tween these two lines is a measure of the internal friction and inertia of the governor. From Fig II, the performance of the governor when associated with thermostatic or other controls can be assessed. This diagram also shows clearly the gas rate at which, under given conditions, effective governing ceases.

The quantitative interpretation given refers to compensated governors, because this type is more common in the industrial field.

Real Requirements

Fig. I permits the assessment of the effective range of inlet pressures within which the governor will give satisfactory performance. The graph shows lines for outlet pressure vs inlet pressure, at rated and at minimum gas flow. In appropriate cases further lines may be added.

Fig. I(a) has been prepared to indicate the method by which the information contained in diagrams of the type shown in Fig. I may be interpreted. It should be made clear that such interpretation is at the discretion of the reader who should bear in mind the actual requirements of the particular installation with which he is concerned.

Initial Setting

In Fig I(a) the overall outlet pressure tolerance is shown; the effective working pressure range for the governor is limited to that within which the outlet pressure is within ± 0.25 in. w.g. of the set outlet pressure (point P). It will be remembered that this point arises from the initial setting of the outlet pressures, carried out at half the gas rate quoted in Table I and therefore does not necessarily lie on either of the lines shown. It is of course not expected that a governor will govern satisfactorily in an inlet pressure less than 0.5 in. w.g. above the set outlet pressure. A well designed governor should give satisfactory performance at inlet pressures up to 10 in. w.g.

May Extend

The range of gas rates, within which the governor has a satisfactory working pressure range, should extend from the minimum to the rated gas flow. It may of course, extend to higher gas flows, and this can be determined by inspection of the curves given in Fig. I.

Fig. II is a plot of outlet pressure against gas rate for a fixed inlet pressure. Two lines appear, one for falling and one for rising gas rate. The distance between these two lines should not be more than 0.1 in. w.g. within the effective working pressure range as determined from Fig. I.

Hunting and chattering should never occur.

The outlet pressure thrown by the governor when all weights are removed should never exceed 1.2 in. w.g. A value of 0.5 in. w.g. is desirable.

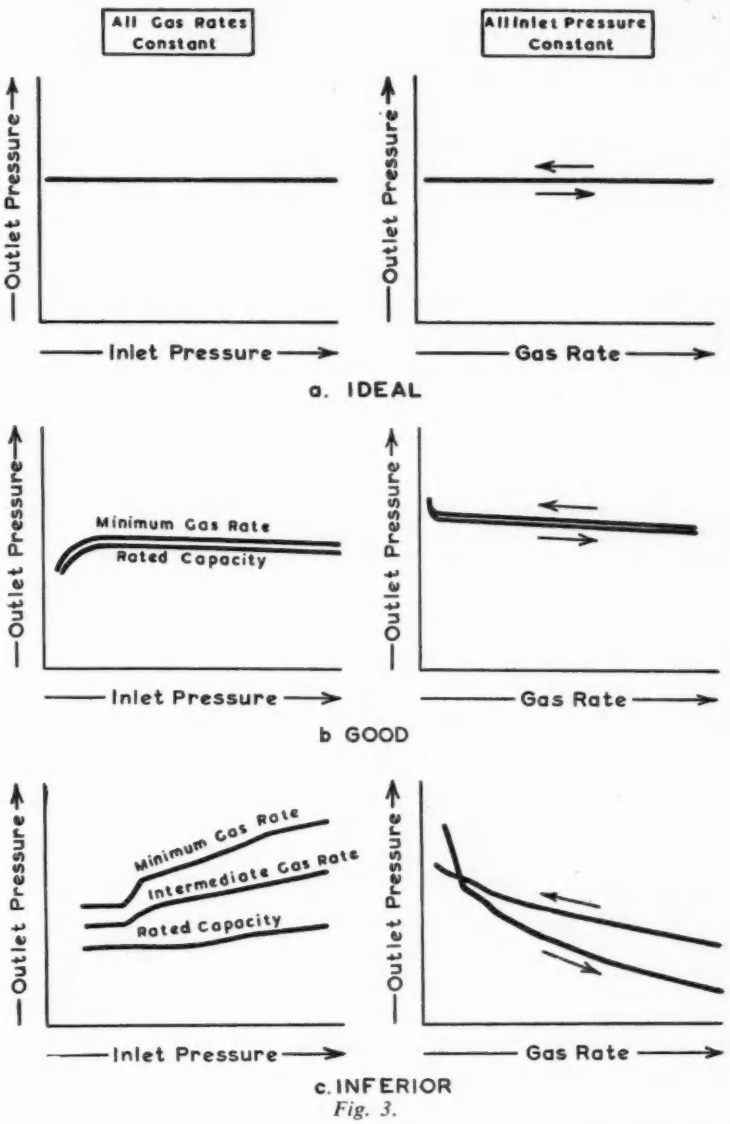


Fig. 3.

OVERHEAD HEATING—

(Continued from p. 130)

Where the luminous type of heater is used there is the added comfort effect of a warm glow.

It is claimed that, being clear of the occupational activities of the workmen and of simple design, the maintenance cost is reduced to a minimum.

This form of heating also has its application in shops and restaurants where there are often cold or draughty patches that are difficult to eliminate by floor radiators or heaters which also take up valuable floor space that could otherwise be more usefully occupied by tables, showcases, etc. Under the Shops Act of 1934 it is compulsory to provide conditions that will keep the assistant comfortable. Overhead radiant heating offers a solution to these difficulties and gives a flexibility otherwise unobtainable.

When planning the heating of premises where perishable goods are stored particularly important considerations are involved; radiant heating ensures that a condition of comfort can be attained with a lower air temperature and the heating can be localised.

EAST MIDLANDS GAS BOARD TEST NON-SCALE FURNACE BY ROYCE

THE East Midlands Gas Board* have carried out tests on the non-scale furnace manufactured by Royce Electrical Furnaces, Ltd., of Walton-on-Thames, Surrey. The makers claim that, by using oxygen for combustion instead of air, the normal loss of steel from surface attack by the furnace gases, in such processes as reheating prior to forging or rolling, can be substantially reduced.

It is known that oxidation of steel can be very largely prevented by employing a special or prepared atmosphere, and that such an atmosphere can be produced from the partial burning of town gas. In the past, however, bright or clean heat treatment, as it is normally termed, has been almost solely confined to annealing and hardening. In these cases, muffle type furnaces heated by either gas or electricity are employed.

The special atmosphere is then introduced into the working chamber, not for the purpose of heating, but to replace the air by a mixture of gases, which on balance, is chemically inert to the steel. For reasons of cost, and the need for a high rate of heating, direct fired furnaces are employed for reheating, and in these furnaces the products of combustion come in contact with the steel billets.

Combustion is regulated to minimise, as far as practicable, surface damage to the steel which can take the form of:—

1. Oxidation or scaling.
2. Loss of surface carbon, or decarburisation.

In either case it means a loss of steel, which, in the more expensive alloys, represents an appreciable financial loss exceeding the total fuel cost.

Forging Temperature

By using oxygen instead of air the forging temperature can be obtained even with partial combustion of the gas, thus making it possible to use a normal direct-fired forging furnace with the products of incomplete combustion heating the furnace and stock, while also forming the neutral atmosphere.

The atmosphere can be made similar to that successfully employed in bright annealing, with the principal exception that water vapour is present, whereas, in the annealing process, the water vapour is partially or completely removed. Water vapour is a decarburising agent, and also considerably accentuates the decarburising action of the free hydrogen in the partially burnt gas.

It is most important to avoid, or at least minimise, the loss of surface carbon, particularly with high-speed steels, and, therefore, the direct-fired furnace, even when using oxygen, may have certain limitations.

Direct Fired

The furnace, shown in Figs. 1 and 2 is direct fired, and consists of separate high temperature and preheating chambers. The hearths of the high temperature and preheating chambers are 6½ in. and 11½ in. respectively from the roof, and the overall heights of the chambers are 11 in. and 16 in. respectively.

The centre line burner is 8 in. from the hearth of the high temperature chamber. Firing is by means of a single burner designed to burn gas with air or oxygen or a mixture of both. The burner is situated at one end of the high temperature chamber, firing under the roof and over the hearth.

Neutral Atmosphere

When the furnace is at forging temperature, the gas and oxygen ratio is regulated to give incomplete combustion, thus providing a neutral atmosphere which surrounds the steel billets. The gases then pass to the preheating chamber, where secondary air is supplied to complete combustion which serves to preheat the steel billets or stock prior to their transfer to the high temperature chamber. From the preheating chamber the gases flow to a recuperator where the

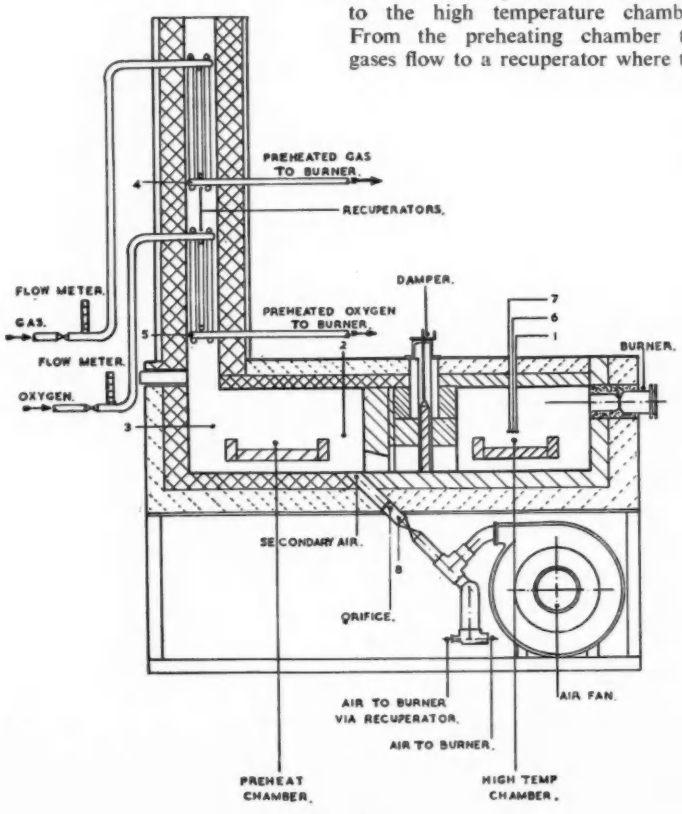


Fig. 1.

* This information is reproduced from Report No. 660/57 of the Industrial Gas Development Committee of the Gas Council (Information supplied by Watson House Laboratories).

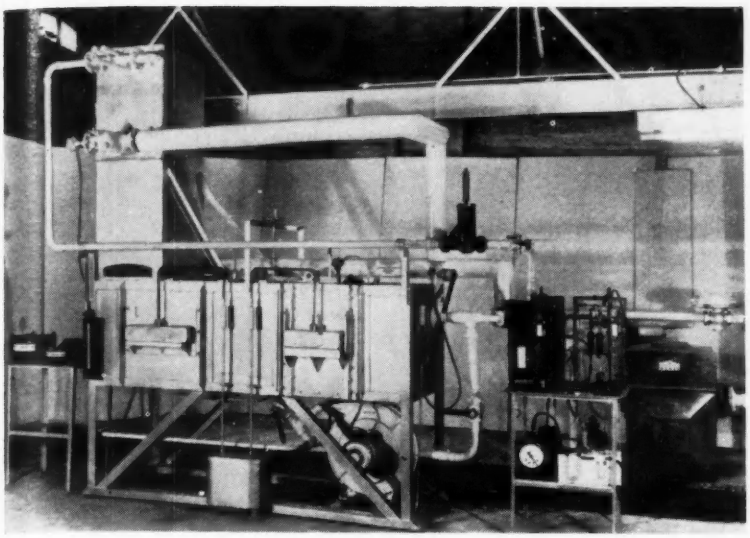


Fig. 2.

town gas, oxygen and air if used, are heated.

A damper is arranged between the two chambers so that a positive pressure can be maintained in the high temperature section to preclude the entry of air. The reduced volume of products of combustion when using oxygen presented a particular difficulty in maintaining a positive furnace pressure, and it was found necessary to modify the damper so as to give minimum clearance between the damper and its guide.

Steel Used

The tests were carried out at the Industrial Gas Development Centre, Sheffield, in collaboration with Dr. H. A. Fells, and the British Oxygen Co., Ltd. The steel samples were provided by Samuel Osborn & Co., Ltd., Sheffield, who also conducted the metallurgical examination of the samples after treatment.

The steels used were:—

(a) Plain carbon steel .. 0.5% carbon
(b) Plain carbon steel .. 0.9% carbon
(c) High-speed steel .. 18% W, 4% Cr, 1% V
(d) High-speed steel .. 6% W, 5% Mo, 2% V

The samples were ground to remove surface defects and gauged before testing at different furnace temperatures. The cold steel samples were placed, without preheating, directly into the high temperature chamber, which was maintained at the forging temperature.

After heating they were immediately cooled in an oil bath. The reason for not preheating the specimens was that the sole object of the test was to determine the effect on the steel of the atmosphere in the high temperature chamber and not to assess the furnace efficiency.

Since the object of the test was to determine the effects of the products of partial combustion of town gas, using oxygen instead of air on various plain carbon steels and alloys, and with particular reference to decarburisation, they were carried out under the following conditions:—

(a) Gas and oxygen in fixed proportions.
(b) Varying periods of time.
(c) Steel samples 6 in. long by 1 in. diameter nominal.

Although the furnace was manually controlled, the actual temperatures in the high temperature chamber did not exceed the design temperature by more than ±20°C.

The results obtained indicate that, under the test conditions, it is possible to heat the various steels to forging temperature with virtually no scale. It would appear, however, that loss of surface carbon, or decarburisation occurs, and is not dissimilar to that experienced on a modern gas fired open type furnace using air for combustion and adjusted for optimum conditions.

A second series of tests was then carried out. 1. To establish a standard of scale formation and loss of surface carbon for the same range of steels as used in series I. They were treated in the same furnace under similar conditions but using air for combustion instead of oxygen, in order to make a direct comparison with the results obtained when using oxygen.

2. To determine the effects of different gas:oxygen ratios to help find the optimum ratio to prevent scaling and loss of surface carbon.

These tests were carried out under the following conditions:—

(a) Gas and air.
(b) Gas and oxygen in varying proportions.
(c) Fixed heating period of 45 minutes.
(d) Steel samples 3 in. long by 1 in. nominal diameter.
(e) No pre-heating of air or oxygen, due to defects developed in the pre-heater.

The furnace was manually controlled since it was found impossible to adhere strictly to the stated temperatures in the high temperature chamber, the design temperatures were aimed at in each test.

Any variations from these temperatures were noted. The design temperatures were not, however, the mean temperature in the chamber.

The tests established that in an open type gas fired furnace, steel can be heated to forging temperature without scale formation by using oxygen instead of air for combustion. To achieve this scale free condition a gas:oxygen ratio greater than 2.4:1 must be used. At gas:oxygen ratios below 2.2:1 there is no significant difference with regard to scaling between this method and the use of air for combustion.

This scale-free heating represents an advance in the field of forging, where loss of steel by oxidation inevitably occurs in the normal furnace atmospheres of liquid, solid and gaseous fuel fired furnaces.

The tests also suggest that decarburisation of high-speed steel can be reduced, but not prevented, by using oxygen. There are, however, certain anomalies which make the findings inconclusive.

The use of a gas:oxygen ratio of 3.0:1 showed that were possibilities of realising non-scale heating without excessive decarburisation, but such results were obtained in a small batch type furnace under test conditions. No regard was taken of thermal efficiency or costs of production. Further knowledge from large batch type or continuous furnaces under normal operating conditions are necessary before definite conclusions of the usefulness of the process can be drawn.

COFFEE DRINKING IS INCREASING

We must meet new trend, says 'Gastronome'

WE are a tea drinking nation, in fact, we consume more tea per head of population than any other country in the world, 8½ lb. per annum to be precise. But today there is a distinct trend in our drinking habits towards coffee and this is, in one respect, reflected in the mushroom growth of coffee bars throughout the country.

This trend is spreading into the catering establishments of industry. And it is worth studying and associating ourselves with it in its early stages because industrial management is going to start asking questions about making and serving coffee and it might as well be us in the gas industry who supply the answers.

Importance of Method

So we must know something of the equipment available and of the various methods of coffee making. This is as important as a knowledge of industrial processes when discussing factory equipment installations.

In catering in general there is an appalling lack of know-how in the recipes used and the methods of preparation of some foods and beverages. One of the most common faults is found with coffee making which is one reason why there are so many proprietary brands of instant coffee products on the market.

Yet it is simple to make coffee, just as it is simple to prepare and cook foods if basic principles are observed, that is, to obtain a suitable recipe and to follow it carefully. Nothing could be easier than that.

Only the Best

Industrial catering is no exception, and it has in its sphere some of the finest restaurants and food services to be found anywhere. But it also has many mediocre restaurants serving mediocre food and beverages, and efficient industry cannot afford to have anything but the best—and the best is easily achieved without necessarily adding to costs.

Coffee worthy of its name must be of good flavour and strength, and have the aroma peculiar to it. These are in large measure achieved by following golden rules, rules that apply in all classes of catering, large and small:—

1. Use freshly ground coffee of a good blend.
2. Use freshly drawn tap water .
3. Measure coffee and water accurately, leaving nothing to guesswork.
4. Having made the coffee, store it at the correct temperature.

Selection of Blend

5. Observe all hygiene rules and keep all equipment clean.

It is not always convenient to grind the coffee beans oneself. Excellent coffees are obtainable from grocery suppliers, who will not only advise on special catering blends suitable for bulk making but will grind to the required grade.

Selection of the blend is a matter of choice, chicory can be added to make the cost of the cup of coffee lower, but it does deteriorate when the brew has to be kept in hot storage pending serving.

The amount of coffee to use is perhaps the most important thing in producing good coffee. It is 12 oz. of coffee to one gal. of water. This gives an excellent brew and may be diluted by milk; as black coffee it is sure to please and may well be accepted as a basic recipe.

As with tea making, it is important to use freshly drawn tap water, in clean and fresh containers.

It is advisable to keep storage time of brewed coffee to a minimum, indeed so important is this, that it is better to make fresh brews at intervals according to the rate of service. Storage is best done in containers of earthenware or glass as metal tends to 'flavour' coffee.

Coffee and milk should be stored separately, the coffee at 185°F. and the milk at 150°F. Milk must never be allowed to boil, it is a disaster to the coffee if it does. It is very important to remember the foregoing golden rules; to depart from them is to ask for criticism.

The term bulk coffee making is used but may imply as little as 2 pints which is sufficient brew for seven cups of black coffee or ten of coffee and milk, and up to 4 gal. which will produce 108 cups of black coffee or 160 of coffee and milk on a ⅔rd and ⅓rd basis. Bulks above 4 gal. can be made but because of the deterioration in storage, smaller brews and reduced storage time are to be recommended.

Filtration

To make coffee, place the correct amount of coffee in a container of required capacity and add the freshly boiled water. Stir vigorously and allow to settle, which should take about 5-8 minutes; strain into another

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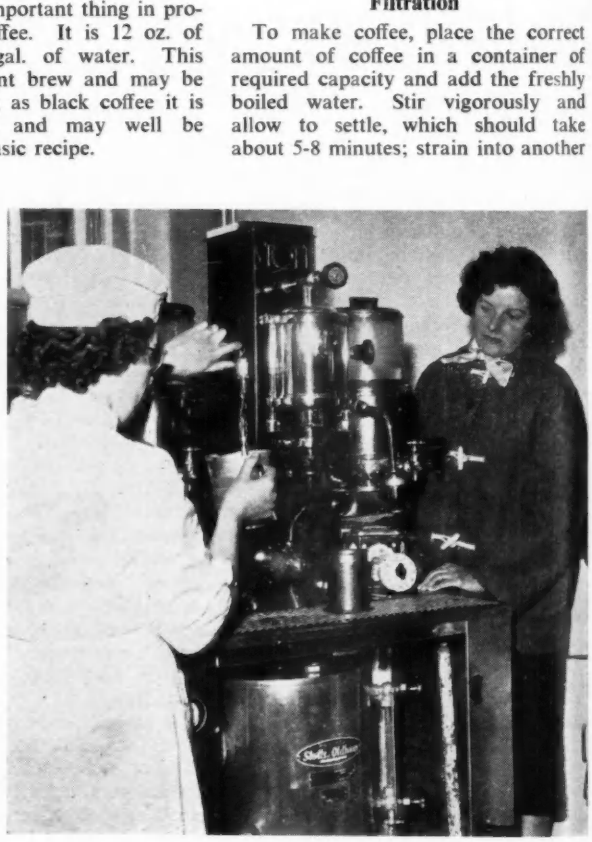

The Stott pressure boiler and coffee maker in operation.

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Stott equipment in an industrial restaurant.

container that has been preheated and the coffee is ready for service. The container may be a stewpan, large jug or urn.

The filtration method is adapted by the principal coffee machines with variations according to the particular machine. The coffee is placed in the infusing container which can be an integral part of the storage urn or may be separate as with the pressure sets.

The 'boiling' water is sprayed over the coffee and the brew passes through filters or a bag and drips into the storage; with the 'pressure' boiler it is passed to the container urn by a gentle pressure of steam.

The vacuum class of filtration uses two containers, one on top of the other; the lower container holds the water which, when just off boiling point, passes up past the filter to the top container holding the fresh coffee, the brew takes place by the maintenance of this 'boil,' which continues at a gentle rate for 3-4 minutes.

At this point the heat is turned off and the vacuum draws the coffee through the filter to the lower container and is ready for service from this container. This class of coffee maker is produced in glass containers complete with gas burner boiling plate or in metal containers with gauge glasses and controls for observation during the process.

In introducing the equipment available for coffee making it is well to draw special attention to the fact that although the term 'boil' has been used, the actual temperature should not exceed 205°F. This is determined with the overflow class of water boiler by heat loss in the filling arm and the air space at the infusing chamber of the coffee urn.

The pressure boiler is normally fitted with a coil to cool the boiling water down to the prescribed temperature before entering the infusion box and the vacuum class is looked after by the temperature of boiling water in a vacuum being of the order of 205°F.

The reason for keeping down the water temperature is that at 212°F.

Jackson T4 20-gal. tea brewer in stainless steel fitted with 12-pint coffee and milk urns.

certain flavours are extracted from the coffee ground which spoils the characteristic flavour and aroma of coffee and indeed introduces a bitterness without any advantage to compensate for it.

In coffee brewing with overflow boiler cafe set the boiling water is produced from the main boiler itself and is controlled by tap above the coffee brewing urn, into which the coffee is placed. The water sprays on to the coffee which is placed on a filter, it then passes through into the urn below where it is kept at the serving temperature by a jacket of hot water.

Recommended Method

Some of these sets use a bag which acts as a filter but can also be in the coffee brew itself in which case a measure of absorption takes place. Other models use a filter plus a filter paper which controls the filtration by a drip into the urn below, the latter method is to be recommended. Storage capacities of coffee in the urn are normally between 1 to 4 gal., sufficient at one brew to serve 40 to 160 cups.

Makers of this class of coffee maker include Aquafont Industries, Ltd.; Bartlett & Son, Ltd.; Eclypse Copper Company; Hodgkisons, Ltd.; Jackson Boilers, Ltd.; Lumbys, Ltd.; Maxol, Ltd.; Oliver Toms, Ltd.; and Stott & Co., Ltd.

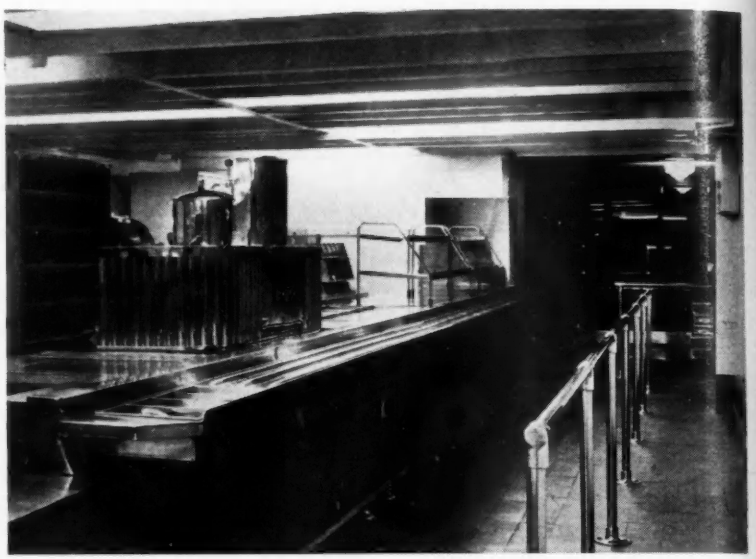
Pressure type café sets use a brewing box in which the coffee is placed in a filter cup. The box is closed by mechanical clamping and the 'boiling' water is sprayed into it; the brew, which takes 2 to 3 minutes, is then passed by a controlled steam pressure into one of two storage urns, a second brewing can then be made and the storage urn filled.

Brews While Serving

This design has the advantage of allowing brewing to take place while actually still serving and enables freshly made coffee to be available. Makers of pressure boilers include Minimax, Still and Sons, Ltd.; Sumerlings, Ltd.; and Stott & Co., Ltd.

The operation of vacuum coffee makers has already been explained. The metal containers of up to 4 gal. are available from Staines Equipment Co., Ltd., and Sumerling, Ltd., and are known as the plateau coffee makers.

The glass container models using this method are made by the Cona Coffee Company and Jackson Boilers, Ltd. This equipment gives a first class brew of coffee. A 4-container battery for instance in the hands of competent staff will provide up to 300 cups of coffee per hour, all freshly made.



Jackson tea and coffee set installed on restaurant counter.

Speed is increased if the water in the boiler container is already preheated to about 180°F. Without wishing to draw special attention to any one particular piece of equipment among a very fine array of coffee makers of various manufacturers, and because its appearance although nicely styled and efficient looking does give the impression of speciality rather than bulk, let it be said that this class of machine is used in a wide class of catering where speed and bulk are essential.

Turning to the cost of ingredients, the basic recipe of 12 oz. to 1 gal. of water has been given and it is false economy to depart from it. At this rate the cost of ingredients is reasonably low and is a practicable proposition for the industrial restaurant.

One gal. of coffee will need 12 oz. of coffee at 8s. per lb., 6s.; 4 pints of milk at 7½d. per pint, 2s. 6d.; and 1 lb. sugar at 8d. per lb., 8d.; making a total of 9s. 2d.

With ⅔ coffee and ⅓ milk and using 8 oz. cups this will produce about 34 cups. Cost of ingredients per cup 3¼d. at retail prices. Add reasonable overheads and a cup should sell at 4d. a cup and show a profit—and it will be a really good and strong cup of coffee, coffee as it should be made.

No mention has been made of two modern trends—Espresso coffee making and vending machines. The first appears to have been halted and in any case is hardly likely to gain a footing in industry as the product, as a beverage to refresh the worker, lacks appeal.

There is a terrific trend in vending machines supplying almost all beverages. They include, coffee service but it is thought that this method is such a poor second to the personal touch in making and serving that its future is problematic.

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Cona coffee-making machine with milk storage in centre.

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